

A Multi-Variable Threshold Approach to Landslide Prediction: Integrating Rainfall, Soil Moisture, and Soil Texture in Indonesia

Authors

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Supplementary materials

Table S1: Existing operational thresholds of 1-day and 3-day antecedent rainfall thresholds in Sumatra, Java, Kalimantan Sulawesi and Papua Island.

Island	1-day (mm)	3-day (mm)	Source
Sumatra	32.86	91.29	Yuniawan et al. 2022
Java	30.00	64.00	Sabo Engineering Office Operational Determination
Kalimantan	33.47	113.87	
Sulawesi	30.00	64.00	Sabo Engineering Office Operational Determination: Adopting Java thresholds from Yuniawan et al. 2022
Papua	30.00	64.00	

Table S2: The VSW value and performance of selected thresholds in each layer over five islands. The blue colour indicates the thresholds with the higher performance, while the red colour indicates thresholds with lower performance among the selected thresholds

Thresholds/Performance			VSW value	Accuracy	True Positive Rate	True Negative Rate	Youden Index
VSW1	Sumatra	P-40	0.410	0.576	0.599	0.572	0.171
	Java	P-40	0.421	0.603	0.599	0.603	0.202
	Kalimantan	P-40	0.411	0.480	0.712	0.414	0.126
	Sulawesi	P-40	0.417	0.524	0.715	0.470	0.185
VSW2	Sumatra	Average	0.409	0.559	0.636	0.543	0.179
	Java	Average	0.423	0.612	0.599	0.615	0.214
	Kalimantan	P-50	0.417	0.619	0.500	0.642	0.142
	Sulawesi	P-40	0.419	0.536	0.715	0.485	0.200
VSW3	Sumatra	P-50	0.415	0.635	0.500	0.662	0.162
	Java	P-40	0.417	0.609	0.599	0.612	0.211
	Kalimantan	P-50	0.417	0.605	0.500	0.626	0.126
	Sulawesi	Average	0.419	0.595	0.561	0.601	0.162

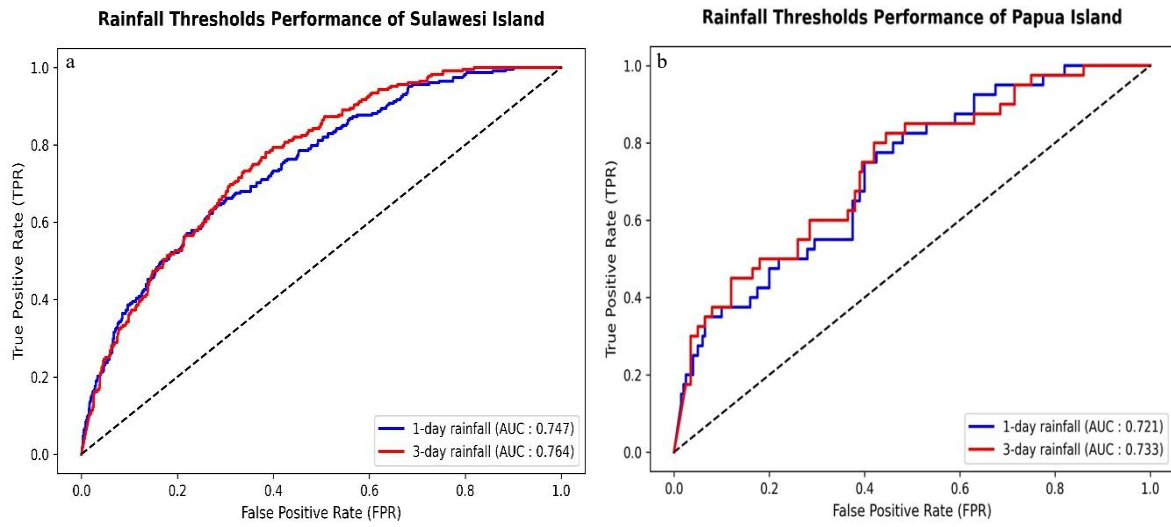
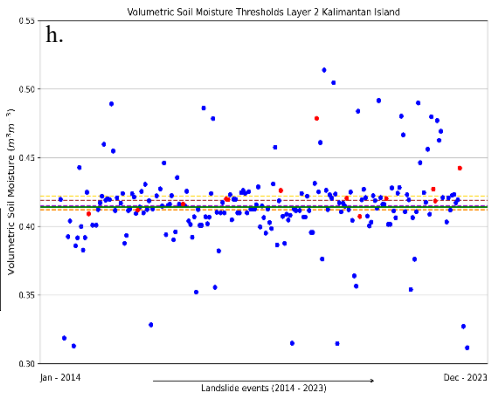
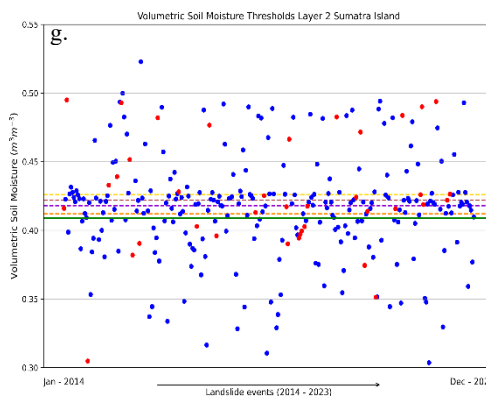
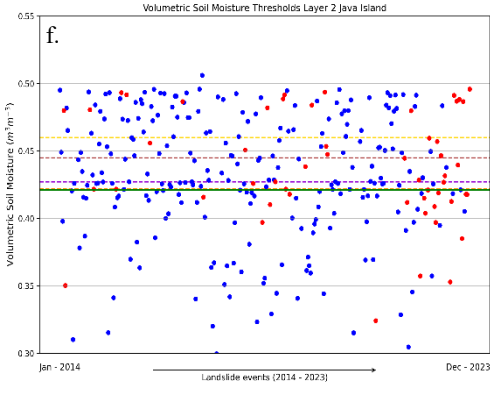
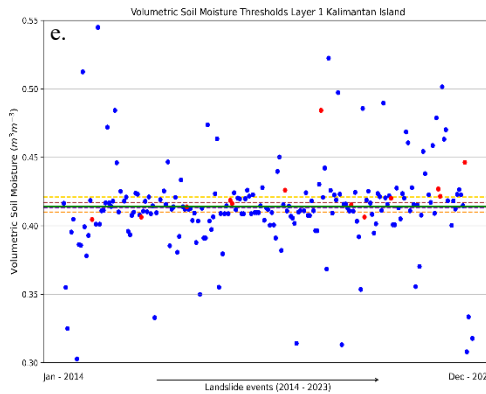
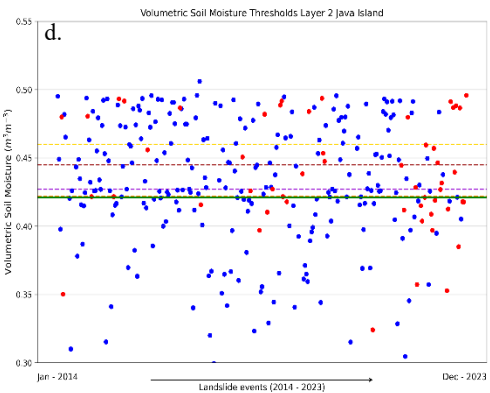
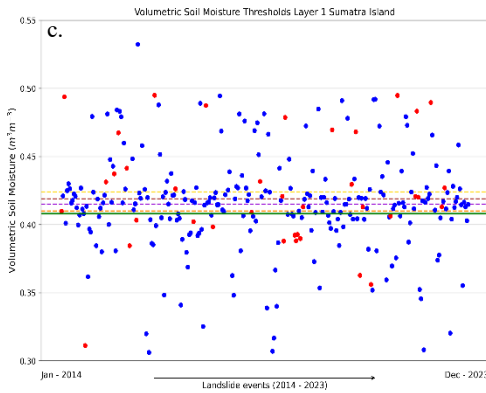
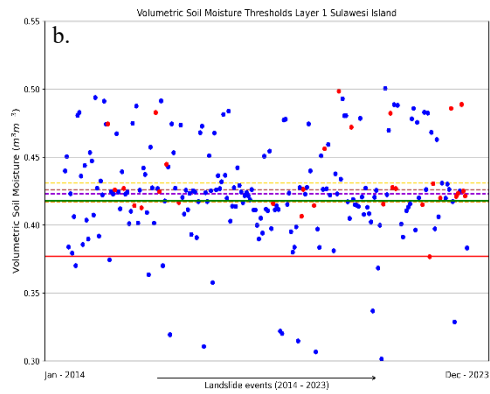
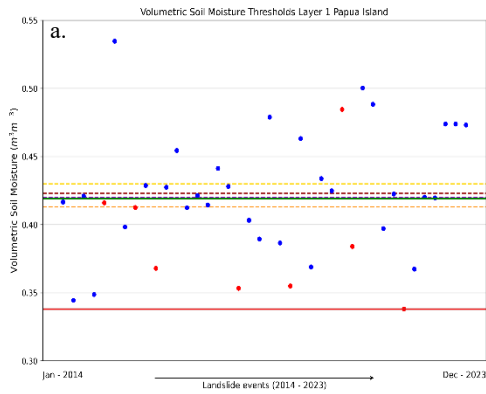


Figure S1: ROC curve of 1-day and 3-day effective antecedent rainfall of: a) ROC curve of 1-day and 3-day effective antecedent rainfall in Sulawesi Island, b) ROC curve of 1-day and 3-day effective antecedent rainfall in Papua Island



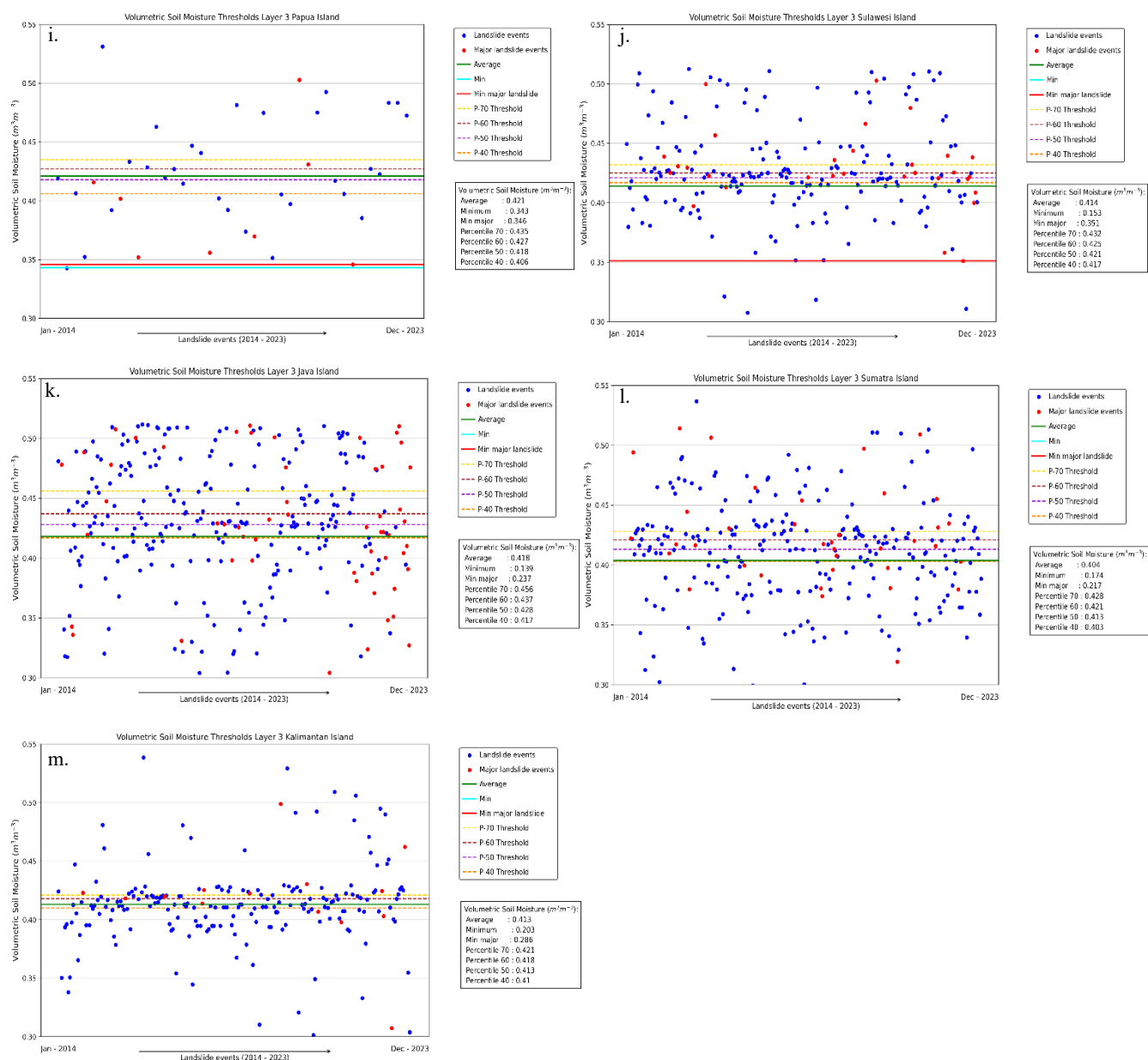


Figure S2: VSW thresholds of a) Sulawesi VSW1, b) Papua VSW1, c) Java VSW1, d) Sumatra VSW1, e) Kalimantan VSW1, f) Java VSW2, g) Sumatra VSW2, h) Kalimantan VSW2, i) Sulawesi VSW3, j) Papua VSW3, k) Java VSW3, l) Sumatra VSW3, m) Kalimantan VSW3. The blue and red dots represent the amount of VSW during the landslide events, with red colour indicating major landslide events. Lines indicate the thresholds derived from statistical analyses.

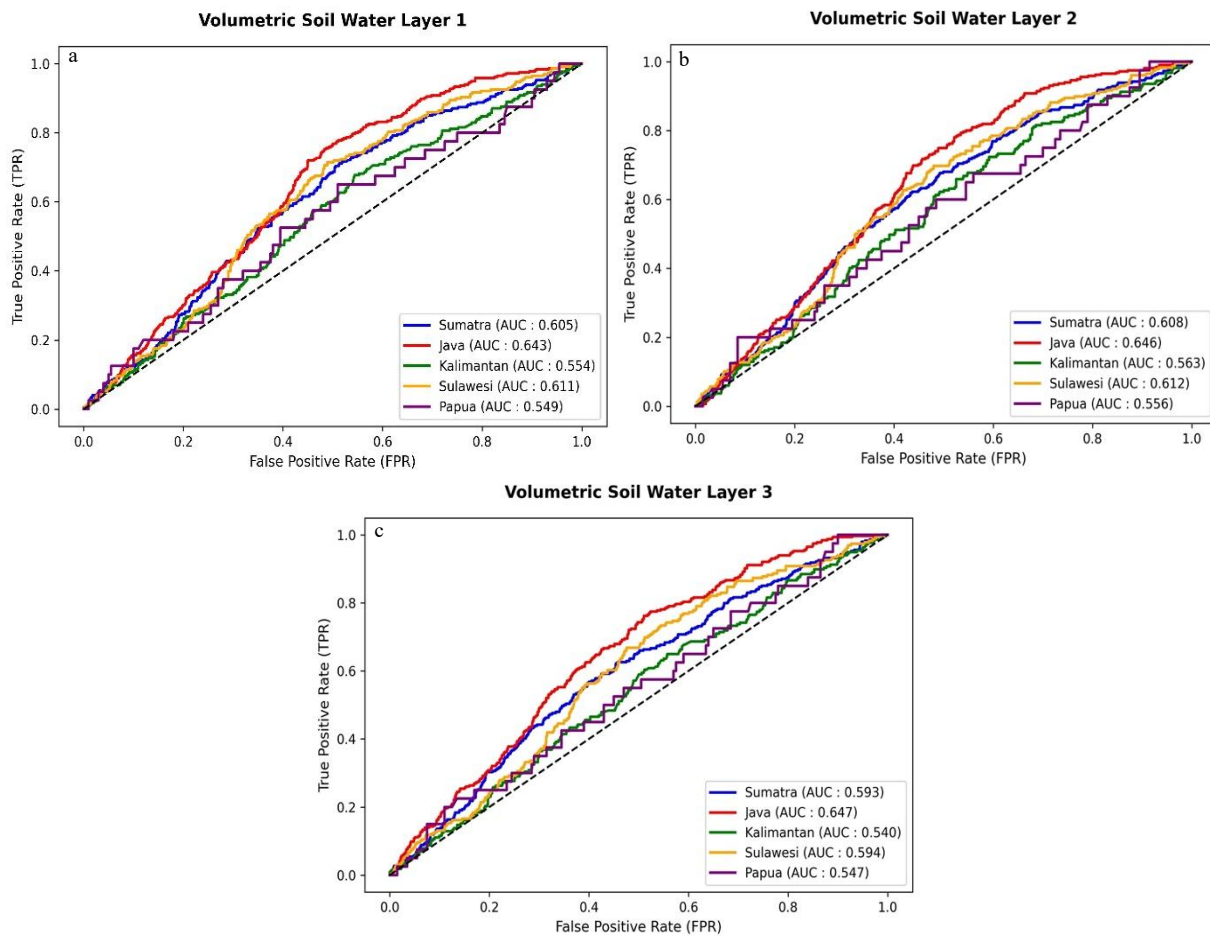


Figure S3: ROC curve of VSW in Sumatra, Java, Kalimantan, Sulawesi and Papua Island of: a) VSW layer 1, b) VSW layer 2, c) VSW layer 3

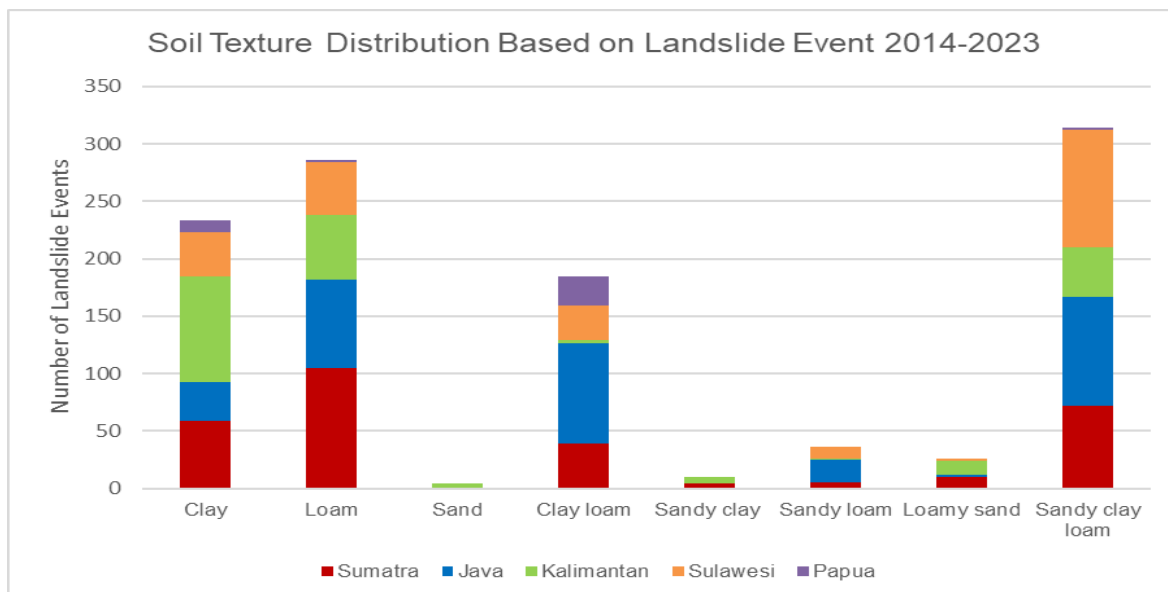


Figure S4: Distribution of soil texture on landslide locations in five islands from 2014-2023

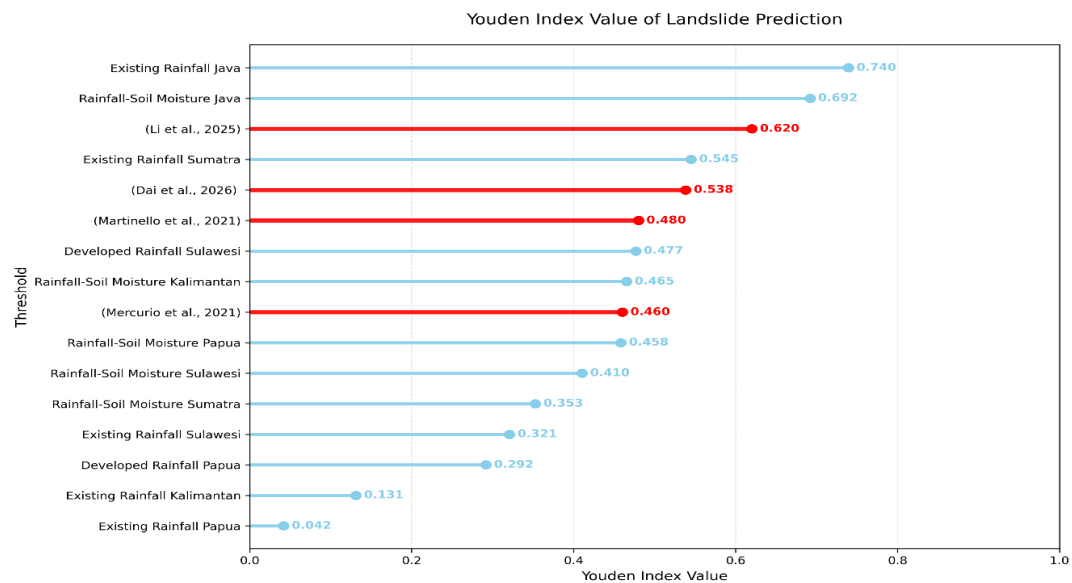


Figure S5: Youden Index value of landslide prediction from the previous study and the existing, developed and combination thresholds of this study